phyletic characters of the ferns can be estimated, the criterion of position of the nascent sorus may be held to take precedence, in point of early origin and constancy, over any soral characters except the primal features of the sporangium itself, and over any anatomical characters of the axis derivative from the protostele." This is certainly an important conclusion, and in accordance with it, the leptosporangiate ferns (exclusive of the Osmundaceae) are grouped into two series: the "Superficiales," in which the origin of the sorus is constantly from the leaf-surface; and the "Marginales," in which it is as constantly from the margin.—J. M. C.

Morphology of Riccia.—Miss BLACK[40] in a recent study of *Riccia Frostii* Aust. finds that this species is strictly dioicous and that the sex organs are scattered irregularly in acropetal succession. From the standpoint of the arrangement of sex organs, this indicates that *R. Frostii* is more primitive than *R. natans*, in which the antheridia are clustered in a disk, and the archegonia, which appear later, are usually in two rows. From the standpoint of restriction of antheridia and archegonia to different individuals, an advance beyond *R. natans* is clearly indicated.

Miss BLACK agrees with Miss HIRSH,[41] who also studied *R. Frostii*, that the air chambers are not produced by splitting of cell walls at the angles of the cells, but by papillate outgrowth. Unfortunately, the figure given, as was the case in the work of Miss HIRSH, does not show the earliest stage in the development of the chamber, but can as easily be cited as proof that air chambers arise by splitting at the angles of the cells of the dorsal layer. The youngest air chamber shown is too old to settle the question either way, but a study of the relation of cells in the figure indicates that possibly the chamber may have arisen by splitting of the dorsal layer. This splitting need not originally occur within the tissues as some recent writers assume, but may, as DEUTSCH showed in *Targionia*, extend from the surface inward.

The rest of the investigation, which includes the development of sex organs, spermatogenesis, and sporogenesis, gives us nothing new.—W. J. G. LAND.

Peripheral leaf cells.—In many leafy liverworts there is a marked difference in form and markings of the peripheral cells of the leaf as compared with those farther away from the edge. GARJEANNE,[42] as the result of a study of 10 genera, finds that the thickening of the peripheral cells is stronger if the plant is exposed to conditions which give great variation of water content;

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[40] BLACK, CAROLINE A., The morphology of *Riccia Frostii* Aust. Ann. Botany **27**:511–532. *pls. 37, 38.* 1913.

[41] HIRSH, PAULINE E., The development of the air chambers of Ricciaceae. Bull. Torr. Bot. Club **27**:73–77. *figs. 6.* 1910.

[42] GARJEANNE, A. J. M., Die Randzellen einiger Jungermannienblätter. Flora **105**:370–384. 1913.